FOREIGN DIRECT INVESTMENT AND TECHNOLOGICAL ADVANCEMENT IN THE CONSTRUCTION SECTOR OF DEVELOPING COUNTRIES: A CRITICAL PERSPECTIVE.

Oti-Sarpong, Kwadwo[1]; Adukpo, Selorm E.[2]; Adjei, Solomon[3] and Antwi-Afari, Maxwell F.[4]

[1] *Department of Real Estate & Construction, The University of Hong Kong, Pokfulam Road, Hong Kong*
[2] *School of the Built Environment, Faculty of Design, Technology and Environment, Oxford Brookes University, OX3 0BP, Oxford, U.K*
[3] *School of Engineering and Built Environment, Birmingham City University, Millennium Point, B4 7AP, Birmingham, U.K.*
[4] *Department of Building and Real Estate, The Hong Kong Polytechnic University, Kowloon, Hong Kong*

Abstract

Foreign Direct Investment (FDI) inflows are commonly used in developing countries (DCs) to 'measure' technology transfer, and consequently as an indicator for the technological advancement of economic sectors. An implied assertion being that increased FDI in a sector means an increase in foreign technology and knowledge (T&K) in that sector and in effect, technological advancement in the recipient country. An effect of this assumption is an increase in attempts by DCs to attract more FDI through incentive-laden policy reforms. While these efforts have contributed to increase in FDI, particularly in the construction sectors of DCs in Africa; there is, however, scant evidence suggesting that the rising inflows resulted in technological advancements. Thus, construction industries in many DCs continue to lag behind those of advanced countries. This paper takes as a point of departure the relationship between FDI and technological advancement. It argues that reliance on FDI to estimate 'how much' technology has been transferred and as an indicator of attendant advancement has limitations. From a critical perspective, such an assessment is inaccurate and neglects specific nuances of T&K transfer and technological advancement in the construction sector. Examining the Ghanaian construction sector as a case with coeval data, the paper unpacks the blind-spots inherent in the assessment of technological advancements that are heavily reliant on the use of FDI inflows. Insights from the paper contribute to the literature and policy regarding interrelations involving FDIs, the transfer of T&K and technological advancement in the construction sector in DCs.

[1] kotisarp@connect.hku.hk
[2] selorm.adukpo@brookes.ac.uk
[3] solomon.adjei@bcu.ac.uk
[4] maxwell.antwiafari@connect.polyu.hk

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INTRODUCTION

The issue of technology gaps that exist between the construction sectors of developed and developing countries is well-known (Abbott, 1985; Osabutey, Williams and Debrah, 2014). These differences are not solely limited to the use of physical components of technology; it extends to the development and use of non-tangible components (e.g. skills and knowledge) associated with exploiting and modifying the tangible parts to suit contextual needs (cf. Oti-Sarpong & Leiringer, 2018). However, attempts to narrow these gaps are mainly about technology and knowledge (T&K) transfers through arrangements requiring foreign participation. To this end, countries seeking to improve their construction sectors and advance technology in this sector have focused on increasing Foreign Direct Investment (FDI) inflows from developed countries.

FDI is widely recognized as a major means through which firms can participate in different economic sectors of other countries through technical or financial support under specific contractual arrangements such as subsidiary formation, or foreign-local alliancing/partnering/mergers (UNCTAD, 2014). In the construction sector, a recommended approach by the World Bank (2015) for FDI projects is the use of voluntary international joint ventures (IJVs) as vehicles because they allow for close collaboration and cross-party learning to support T&K transfers (cf. Muller & Schnitzer, 2006). IJVs have thus become the preferred medium for T&K transfers under FDI arrangements in developing countries (Osabutey et al., 2014). Thus, inflows typically serve as a key metric for 'how much' foreign T&K is being and by that an indication of technological advancement in a sector (cf. Lumbila, 2005). Furthermore,, for developing countries (DCs), FDI provides a key source of 'debt-free' concessions-based financing for infrastructure projects (World Bank, 2015); contributes to employment creation in recipient countries (Boakye-Gyasi & Li, 2015), and creates access to foreign markets and capital (Okudzeto et al., 2014).

Although FDI is considered to be a means by which T&K transfer and technological improvement occurs, practice in DCs reveals how reliance on such a metric has its shortfalls. Here, it is worth noting that the economic perspectives underpinning studies that establish such claims fail to discuss the processual nature of technological advancement – particularly in the construction sector – beyond the short-term impacts of FDI inflows and what that could suggest (cf. Liu, 2008). Despite

FDI inflows into DCs in Africa being the highest globally in the past years (World Bank, 2015), it is difficult to clearly establish how that has contributed to technological improvement in the construction sectors of such countries. Concurring with the foregoing, Potterie & Lichtenberg (2001) and Siaini & Meyer (2004) argue that it is misleading to infer and generally conclude that an increase in FDI into a country is commensurate with an inflow of T&K into a country's economic sectors. With the construction sectors of DCs trailing those of advanced countries in terms of technological capabilities (cf. Ofori, 2012) despite increasing FDI inflows in the past decade (World Bank, 2015), we critically examine the case of a developing country in West African to present evidence for how the preceding prevails.

This paper takes as a point of departure the assertion that FDI is a measure of T&K transfer and an indicator for technological advancement in the construction sector and unravels the embedded lapses implicit in such an assumption. To this end, we advance two arguments with focus on developing countries. First, that relying on FDI data to determine T&K transfer and technological advancement fails to reveal the 'actual' state of players in the construction sector. Second, that FDI does not necessarily translate into increased T&K and improvement in technological capabilities. Using Ghana as a case, we put forward these discussions from a critical perspective by examining secondary data on the country's FDI trends and how it relates with T&K transfer and the technological advancement of its construction sector.

The next section discusses relevant literature on the relationship that FDI, T&K transfer and technological advancement share and an overview of FDI in Ghana follows. Next, we discuss technological lags in the Ghanaian construction sector, followed by an overview of government-led FDI-related initiatives for the sector's improvement. We then discuss insights from the case study that address the paper's overarching aim.

FDI, T&K TRANSFER AND TECHNOLOGICAL ADVANCEMENT IN THE CONSTRUCTION SECTOR

Foreign direct investment (FDI) is a mechanism that facilitates international participation in various economic sectors through arrangements that include subsidiary formation, acquisitions/take-overs, and IJVs. A number of benefits, including T&K transfer, increased employment and increased competitiveness, have been associated with FDI inflows into recipient economies (Mattoo, Olarreaga and Saggi, 2004). In the construction sector, about technological advancement through project-based foreign-local IJV arrangements are mainly highlighted as gains (Aufray & Fu, 2015). However, the evidence about whether FDI has direct impacts on T&K

transfer and consequently technological advancement remains inconclusive (Blomstrom & Sjoholm, 1999; Liu, 2008). On the one hand some evidence points to some direct impacts that are realized over long periods (Ciruelos & Wang, 2005) and through 'spill-overs' (Bitzer & Kerekes, 2008). Contrastingly there is also evidence to show that FDI does not necessarily lead to direct improvements in technology and related knowledge (Liu, 2008). Despite the split, a consensus in the literature about FDI entry modes is that, approaches that involve local and foreign engagement are preferred and considered more likely to yield desired mutual benefits. IJVs are therefore, reportedly preferred in many sectors, and construction is not an exception (Liu, 2008; Osabutey & Debrah, 2012; Osabutey et al., 2014).

In FDI arrangements for T&K transfer in developing economies, the ownership structure of the projects plays a major role. The preferred ownership structure for FDI projects is IJV, owing to the advantages for learning by close association it offers the parties (cf. Osabutey & Debrah, 2012; Ruiz-Nunez & Wei, 2015). This arrangement is also favoured because it is considered to create room for local parties to learn from foreign counterparts (Ofori, 2000). Additionally, IJVs reportedly create employment opportunities for locals in the host countries. The local jobs created via IJVs for FDI projects is typically considered to reflect the extent to which T&K transfer happens in a sector. Thus, higher local employment suggests a potential increase in the number of local elements acquiring foreign technology and knowledge (Lumbila, 2005), as Tang & Gyasi (2012) suggest in their study of the implications of Chinese FDI on employment in Ghana.

With FDI being a favoured approach to 'fast-track' economic development, it therefore becomes common to find governments in DCs conveniently relying on such records to infer that T&K transfer and in consequence technological advancements is taking place in various economic sectors. This reliance is reflected in government policies, and reports touting technological advancements based on FDI records and focusing on aspects of ownership structures, employment creation, value of investments and foreign participation (cf. Osabutey & Jin, 2016; Osabutey & Croucher, 2018). Whilst such metrics are potentially useful indicators of foreign engagement (technically or financially), they neglect certain critical nuances about T&K transfers and technological advancement, particularly in the construction sector. These include the notoriously slow-paced nature of new technology uptake in construction, context-specific nature of technology and knowledge adoption, and the transience of project teams. This paper expands on these issues by focusing on Ghana's FDI trends and the state of its construction sector.

FDI IN GHANA: AN OVERVIEW

Ghana has in the last three decades experienced steady FDI inflows to key economic sectors including manufacturing, services, tourism, building and construction, trade and agriculture (Okudzeto et al., 2014). Data from Osabutey & Debrah (2012), Osabutey et al. (2014) and records from the Ghana Investment Promotion Centre (GIPC) – the government agency charged with facilitating foreign investment and monitoring a healthy investment climate in Ghana – show that the country has recorded growth in foreign investments in terms of number and value of FDI projects since 1994. Figure 1 shows the trend.

In Ghana, most FDI projects have technology transfer components incorporated and are consequently registered with the GIPC as technology transfer agreements (TTAs) under the provisions of Act 865 (2013) and the Technology Transfer (TT) Regulations, Legislative Instrument (L.I) 1547 (1992). Briefly, TTAs registered as part of FDI projects, are expected to – over time – contribute to the technological advancement of the specific local economic sectors through T&K transfers. Using these TTAs, the GIPC uses FDI inflow records in evaluating T&K transfers and technological advancement. In so doing, technology and its attendant knowledge are largely limited to explicit or tangible elements such as machines, devices, and imported codified knowledge. This approach neglects a comprehensive assessment of the unique nature of the building and construction sector, in particular, where such 'metrics' fail to capture the occurrence of any 'real' technological advancement. Consequently, this lapse in perspective creates an illusion about technological advancement and contributes to sustaining the technological lag in the Ghanaian construction sector. Invariably it bolsters reliance on foreign firms to execute essential projects at the national level.

TECHNOLOGICAL LAGS IN THE GHANAIAN CONSTRUCTION SECTOR

Technology-related lags existing between developed and developing countries is well researched from different theoretical perspectives (Reisman, 2005; Noh & Lee, 2017). In the area of construction, studies report that the latter are behind the former in terms of using new technologies to execute projects (Osabutey & Croucher, 2018; Iyer & Banerjee, 2018). Players in the construction sectors of DCs lack the capabilities to use advanced technology to deliver projects that are complex, of high technological demands (cf. Ofori, 2007) and require a high level of systems integration (Davies, 2009).

Ghana's construction sector reflects the preceding to a large extent (Laryea, 2010, Ofori, 2012). The current situation shows that the construction sector and the actors

involved lag technologically and the reliance on foreign parties remains (Osabutey et al., 2014). For instance, the Ridge Hospital expansion (620 bed facility at USD 250million), Tamale Airport expansion and upgrade-Phase 1 (USD 130million), Terminal 3 project at Kotoka International Airport (USD 278million), the Kwame Nkrumah Circle Interchange (74 million Euros), Kejetia Central Market redevelopment (USD 298million) and the Saglemi Housing Project (about 1500 housing units at USD 200million) were executed by foreign contractors from, *inter alia*, France, Turkey, Brazil and Portugal (Construction Review, 2018). These and other projects reveal and reinforce how and why a majority of the country's construction firms are largely incapable to undertake projects of certain scales, complexity and technological requirements. Few exceptions here, typical with private clients, include the construction of the complex One Airport Square in Accra, as well as ultra-modern Laboratories for Computer Science and Engineering at the Ashesi University campus – all executed by Ghanaian construction firms (Ghana News Agency, 2018). Thus, to a large degree, local firms seem largely incapable of delivering projects for the purposes of education, health, commercial, transport and other socio-economic purposes that demand the use of modern technologies.

The technological lag in Ghana, like other developing countries, is not merely about the absence of tangible components, but the lack of intangible human-centric capabilities needed to operate and adapt technological compositions to suit local contexts for future use (Oti-Sarpong & Leiringer, 2018). This lag leads to the creation and sustenance of a cycle of reliance on foreign construction firms who are deemed more technologically advanced to undertake major projects (cf. Ofori, 1994). To improve the technological capabilities of construction firms, the Government, being a key player in the Ghanaian construction sector, has formulated and revised policies to attract foreign investment in the sector (cf. Boateng & Glaister, 2003; Osabutey & Debrah, 2012; Osabutey et al. 2014). The incentive-laden policies are hinged on the notion that foreign participation would lead to three main outcomes: first, increase technology and knowledge transfer to local construction firms; second, contribute to improvement in attendant capabilities of local firms; and third, ultimately contribute to technological advancement of the construction sector as a whole (Osabutey & Debrah, 2012; IMANI, 2018; Mmieh & Owusu-Frimpong, 2004). The increasing reliance on foreign firms to deliver key national projects in Ghana suggests that, in addition to other contributory factors, the goal for such FDI policies have not been met to a large extent.

FDI AND CONSTRUCTION SECTOR IMPROVEMENT: GOVERNMENT-LED INITIATIVES

Construction is one of the key economic sectors that the Government of Ghana seeks to improve technologically. Through the GIPC, it has rolled out initiatives and crafted policies aimed at attracting more FDI into the sector. The initiatives include the crafting of local content/participation Regulations and Acts in Ghana, including that of petroleum (LI 2204, 2013), general investment (GIPC Act 2013, Act 865), minerals and mining (Act 2006, Act 703 and LI 2173, 2012). Despite the existence of these regulations aimed at technological advancement, it is difficult to establish tangible improvements in the Ghanaian construction sector in terms of technological capabilities (cf. IMANI, 2018).

A reason for the preceding has to do with the temporality of construction project delivery. TT agreements 'die' when a project is handed-over and foreign parties disband to pursue other endeavours in different locations. This situation puts the construction sector (at the project level) in a unique spot that the current laws and regulations fail to address comprehensively in assessing for 'real' technological advancement following FDI projects with built-in T&K obligations. Another aspect of existing laws that do not capture tangible technological improvements in the construction sector is in Section 43 of Act 865 and Regulation 9 of LI 1547. It prescribes that a TTA that is required to be registered with the GIPC must not have a duration of less than eighteen (18) months and not more than ten (10) years. The agreement may be renewed – subject to review and approval by the GIPC – for a period not exceeding five (5) years. This provision outlines the kind of TTAs that legally fall under the oversight of the GIPC – and projects that do not fall within this range may not necessarily be registered with the Centre. This is where construction projects fall off the grid. If crucial infrastructure projects arranged with TT goals are delivered in less than 18 months, there will only be project-level accountability about the fulfilment of transfer obligations by foreign parties that will not fall under the radar of the Centre.

The lack of clear evidence to suggest technological advancement across key economic sectors including construction is reportedly a consequence of the absence of clear policy directions and strategic implementation guidelines (Osabutey & Jin, 2016; Osabutey & Croucher, 2018). Examining the Singapore and China economies, Ofori (2000) and Liu (2008) respectively highlight the importance of these two elements for achieving deliberate technological advancement in the construction sector via FDI projects. In Singapore, Ofori (2000) identified that strategic implementation guidelines helped ensure that through FDI projects, local construction firms could improve technologically over time. The government created project opportunities

allowing local firms to use newly acquired technological capabilities after completing FDI projects with foreign firms. In China, Liu (2008) and Chen & Landry (2018) highlight that the government's clear strategic vision underpinned the successful transformation of their construction industry into one that is presently advanced technologically. However, in developing countries in Africa, studies (e.g. Osabutey & Croucher, 2018; Osabutey & Jin, 2016) identify a lack of both components, sustaining (and possibly widening) the technological gaps between their construction firms and foreign counterparts. Ghana is not an exception here.

The reliance on FID data by Ghana to infer T&K transfer and technological advancement has occurred is also problematic. Sinani & Meyer (2004) in their study of Estonia, for instance, suggest that whilst technology and knowledge 'spill overs' may occur via FDI projects, it is narrow and potentially misleading to rely on FDI inflows data to conclude there is T&K transfer and technological improvement in an economic sector. This study advances the preceding viewpoint by examining the case of Ghana's construction sector. Without annulling the impact of 'spill overs' and direct transfer of T&K via FDIs, we examine how a fairly favourable FDI climate in Ghana has (if at all) led to any tangible improvement in the technological capabilities of contractors in the Ghanaian construction sector. Consequently, we highlight how beyond FDI inflows, a much comprehensive framework for assessing T&K transfer and technological advancement better suits the unique features of the construction sector.

RESEARCH DESIGN AND METHOD

We study the FDI trends and the state of technological advancement in Ghana's construction sector as a case that could contribute insights to understand the plight of other developing countries in West Africa (cf. Yin, 2011).

The paper draws mainly on secondary data obtained from the Ghana Investment Promotion Centre (GIPC), which is the sole supervising body responsible for compiling and maintain FDI data. The data are compiled from fifty-two (52) quarterly investment reports from 2007 through 2018 (both years inclusive). The analysis examines data covering a period when increasing commercial production of crude oil has been attracting more foreign participation to promote T&K transfer. A corollary anticipation here is that, foreign investment in oil and supporting sectors would contribute to an improvement in the technological capabilities of local construction firms – through job creation – to provide infrastructure needed for the oil and gas sector, and others in the future (cf. Obeng-Odoom, 2015; Tang & Gyasi, 2012; Boakye-Gyasi & Li, 2015). The data collected for the period under review therefore adds a critical angle to exploring FDI trends and the prevailing state of Ghana's construction

sector with respect to technological advancement. As Figure 2 shows, the paper adopts a descriptive approach (using aggregated and cumulative values and percentages) to examine the data, representing relevant aspects in tables and charts.

			Overall FDI Information			IJV Ownership Structure & Value				Construction Industry Information										
Year	Quarters	Cumul. Nr of projects	Total number of FDI projects	Total FDI value (US$ m)	Cumul. Value	% of Ghanaian-Foreign IJVs	No of Gh-Foreign IJVs	Cumul. Values	Value of Ghanaian-Foreign IJV projects	No. of const'n FDI projects	Cumul. Nr.	% const'n FDI projects	Value of of const'n FDI projects (US$ m)	Cumul. Value	% const'n FDI value	Cumul. Values	Total no. of local jobs created	Cumul. Value	No. of local jobs created through Const'n IJVs	% of const'n values
2007	Q1		55	36.02		38.6	21		24.02	5		9.09	9.27		25.74		1818		181	9.96
	Q2		90	78.95		46.7	42		47.47	14		15.56	17.21		21.80		4634		1200	25.90
	Q3		64	190.54		39.4	25		10.87	5		7.81	2.17		1.14		3078		257	8.35
	Q4		89	5300.00		38.66	34		682.00	9		10.11	9.56		0.18		15526		1570	10.11
	TOTAL	298	298	5605.51	5,605.51	163.36	123		764.36	33	33	42.57	38.21	38.21	48.85355	25056	25056	3208	3208	12.80
	AVERAGE		75	1401		41	123	764	191	8		11	10		12		6264		802	12.80
2008	Q1		89	3032.58		39.1	35		2986.50	6		6.74	2130.5		70.25		9085		5769	63.50
	Q2		50	58.12		28.3	14		13.8	6		12.00	1.05		1.81		4670		1000	21.41
	Q3		80	1580.86		38.75	31		1300	7		8.75	3.56		0.23		4151		590	14.21
	Q4		76	209.98		35	27		144.08	7		9.21	1.82		0.87		10022		923	9.21
	TOTAL	593	295	4881.54	10,487.05	141.15	107		4444.38	26	59	36.7021	2136.93	2175.14	73.15226	52984	27928	11490	8282	29.65
	AVERAGE		74	1220		35	229	5209	1111	7		9	534		18		6982		2071	29.65
2009	Q1		35	18.05		25.71	9		5.36	1		2.86	0.58		3.21		3493		100	2.86
	Q2		81	111.02		32.53	26		78.06	8		9.88	4.25		3.83		4107		406	9.88
	Q3		80	267.13		38.27	31		170.85	4		5.00	48.81		18.27		11187		559	5.00
	Q4		59	230.6		37.7	22		122.35	5		8.47	64.89		28.14		2272		475	20.91
	TOTAL	848	255	626.8	11,113.85	134.21	88		376.62	18	77	26.2083	118.53	2293.67	53.45307	74043	21059	13030	1539.9796	7.31
	AVERAGE		64	157		34	318	5585	94	5		7	30		13		5265		385	7.31
2010	Q1		103	184.33		40.77	42		32.57	6		5.83	14.12		7.66		6122		357	5.83
	Q2		103	662.53		36.19	37		14.29	6		5.83	7.67		1.16		103928		6054	5.83
	Q3		93	279.55		27.84	26		32.32	7		7.53	27.7		9.91		5312		400	7.53
	Q4		75	141.88		34.76	26		36.79	11		14.67	73.57		51.85		2774		407	14.67
	TOTAL	1222	374	1268.29	12,382.14	139.56	131		115.97	30	107	33.844	123.06	2416.73	70.58032	192179	118136	20247	7217.3609	6.11
	AVERAGE		94	317		35	449	5701	29	8		8	31		18		29534		1804	6.11
2011	Q1		102	376.79		42.16	43		162.02	6		5.88	157.04		41.68		6497		1477	22.73
	Q2		125	590		44.8	56		374.24	9		7.20	48.34		8.19		6673		903	13.53
	Q3		152	3248.5		36.84	56		1196.75	21		13.82	2864.62		88.18		22373		12785	57.14
	Q4		110	3443.5		29.09	32		1001.71	13		11.82	3015.01		87.56		7629		930	12.19
	TOTAL	1711	489	7658.79	20,040.93	152.89	187		2734.72	49	156	38.72	6085.01	8501.74	225.611	235351	43172	36342	16095	37.28
	AVERAGE		122	1915		38	636	8436	684	12		10	1521		56		10793		4024	37.28

Figure 2: Two-part guiding framework and sample of compiled data points

The guiding framework used for analyzing the reports captured data in two main parts (see Figure 2 above). The first part focused on data about the following: overall FDI information (number of registered FDI projects, FDI values), ownership structure of FDI projects (number IJVs and values of percentages foreign or locally owned). The second part focused on data about the number and value of FDI projects registered under construction, ownership structures and the number of consequent (foreign and local) jobs created.

ANALYSIS AND DISCUSSION

FDI inflows and the prevailing situation in the Ghanaian construction sector: A critical view

From the data captured in Figure 1, it is evident that Ghana is enjoying a steadily increasing trend of FDI inflows. The GIPC touts such trends as indicative of T&K transfer into economic sectors of the country, suggesting growth in the economy. Whilst this may hold true from an economic perspective, the fundamental assumption that such trends suggest technological advancement in the construction sector remains flawed as there are aspects of such developments that the figures do not show. Thus, relying on FDI to suggest such improvements remains misleading,

making the fixation of the government and the monitoring body on such an assessment measure problematic. Here, we draw on current examples and past studies about the state of the construction sector (and players) in Ghana to argue why the FDI records – at best, provide partial indications that – fall short in accurately providing evidence for T&K transfer and consequently technological advancement. We discuss these lapses in two main parts. First, FDI inflows and technological advancement for construction sector development, and second, ownership structures, local employment and T&K transfer.

FDI inflows and technological advancement for construction sector development

Overall, the trends (in Figures 3 and 4) indicate a steady growth in FDI inflows into Ghanaian construction sector. Specifically, the cumulative number of FDI construction sector projects and Ghana-Foreign IJV projects shows a positive (increasing) trend (Figure 5). This suggests that, to an extent, there is consistent foreign involvement in the construction sector. Concomitantly there is the introduction of foreign knowledge and physical components of a technology to parties via FDI construction projects (cf. Saad et al., 2002). This trend however does not suggest that the presence of such elements impacts local parties in the ways that governments and supervising bodies envisage (cf. Ofori, 2000). The presence of foreign elements does not necessarily mean recipient parties are obtaining their technology and knowledge as there are issues of absorptive capacity, learning and inter-party issues of trust and willingness to share, all influenced by the kind of (favourable or restrictive) environment of operations (Osabutey et al., 2014; Fu, 2008; Siani & Meyer, 2004).

The construction sector is generally regarded as 'slow paced' in technological advancements. Low absorptive capacities in technology about the actors in the sector in developing counties reportedly exacerbate this situation (Osabutey et al., 2014). The prevailing scenario in the Ghanaian construction sector shows the presence of many foreign construction firms (including from China, Brazil and Israel) undertaking a variety of complex and technologically-demanding projects for education, public housing, transport and commercial purposes (cf. Construction Review, 2018; Oti-Sarpong, 2019). Even after over a decade of engaging with foreign parties on FDI projects Ghanaian construction firms still lag technologically.

Figures referenced in Analysis and Discussion

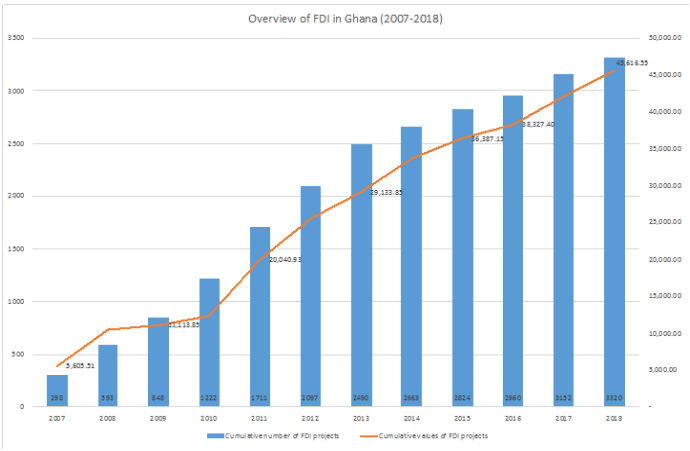

Figure 1: Overview of cumulative FDI trends in Ghana

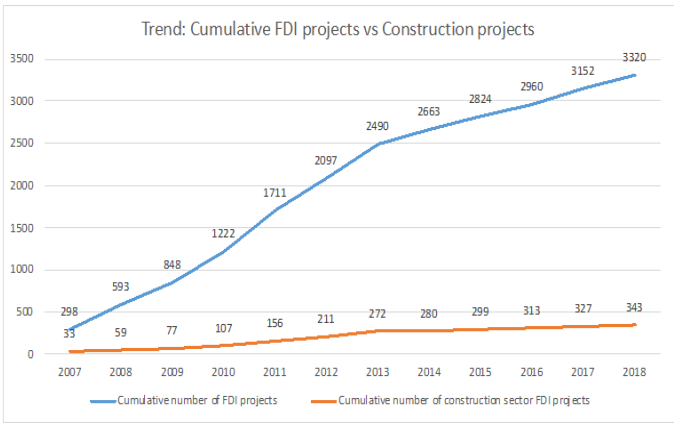

Figure 3: Cumulative number of FDI projects vs Construction projects

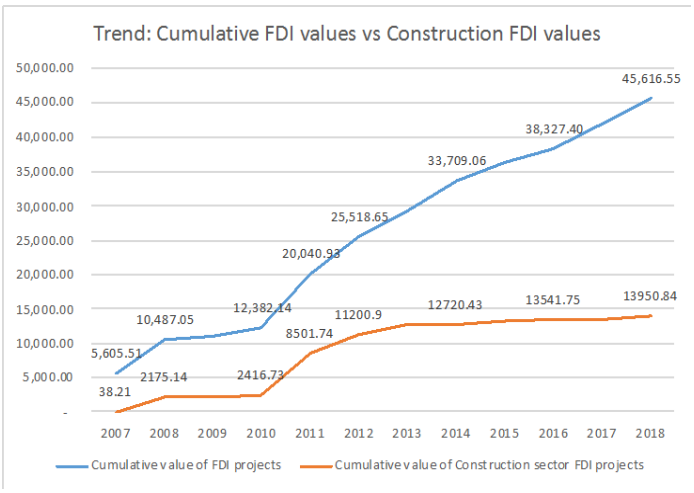

Figure 4: Cumulative values of FDI projects vs value of Construction sector investments

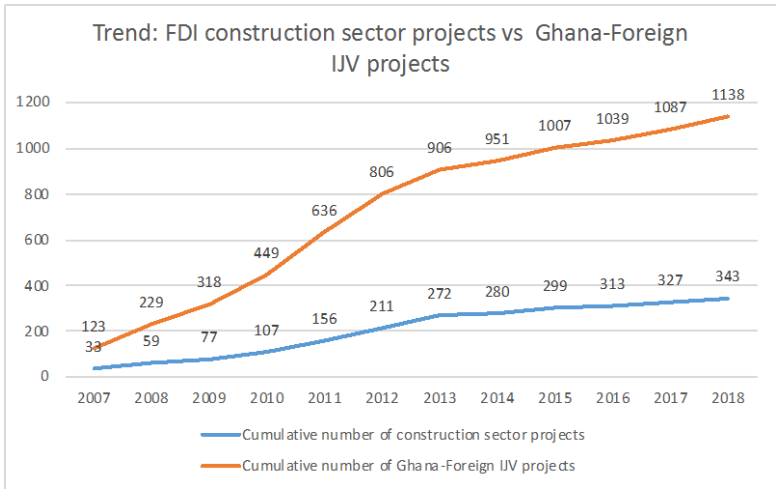

Figure 5: Cumulative construction sector projects vs Ghana-Foreign IJVs

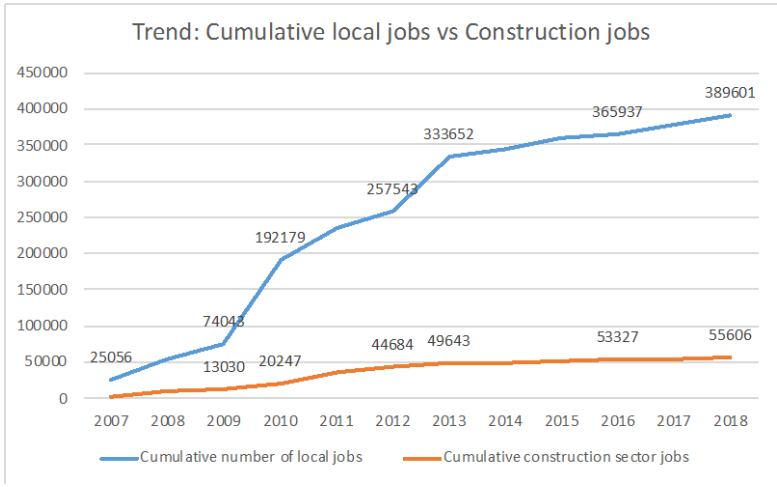

Figure 6: Cumulative local jobs vs Construction jobs

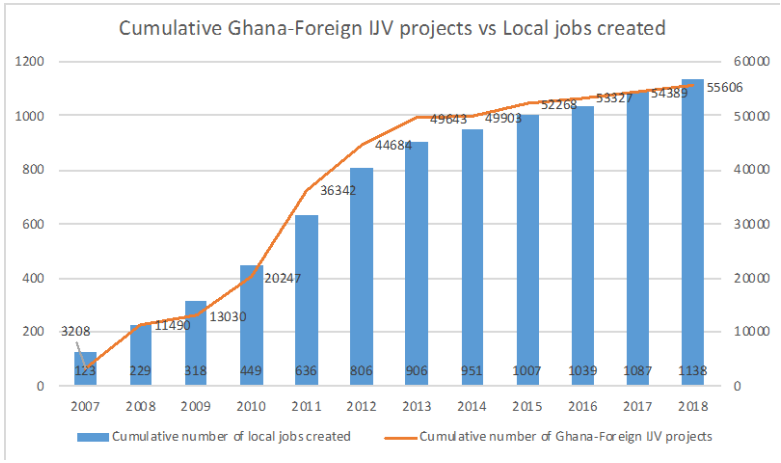

Figure 7: Cumulative Ghana-Foreign IJV projects vs Local jobs created

The prevailing situation is not new (see Laryea, 2010). The general absence of strategic government initiatives to engage local firms on projects of similar scales to the ones with foreign involvement creates difficulties on assessing how local parties absorbs new technology, localise such technology, and improve (or not) from project to project over a period. There is thus limited opportunities to assess if local parties tend to engage in long term learning or otherwise. This approach starkly contrasts with that adopted by countries such as Singapore, Korea and China (see Ofori, 2000 and 2007). In these countries, the key role of government-led strategies that created opportunities for local firms after years of working with foreign parties on projects (cf. Osabutey & Croucher, 2018) ensured the technological advancement of their construction sectors. Technological advancement thus does not take place over one project. It involves learning, trialling, adaptation, modification and further localisation for parties to develop the level of capabilities needed to proficiently use the technology (Manimala & Thomas, 2013).

FDI vehicle (IJV) ownership structures, local employment and T&K transfer

The positive trend of local-foreign IJVs recorded over the period under review is unsurprising for a burgeoning economy like that of Ghana (Okudzeto et al., 2014) where foreign investment is projected to grow (cf. World Bank, 2015). IJVs serve strategic and competitive intentions of foreign and local firms in the short, medium or long terms (Osabutey et al., 2014; Osabutey & Jin, 2016). However, IJVs are also known for embedded structural limitations they pose to T&K transfer especially between parties from developed and developing countries (Devapriya & Ganesan, 2002). At best, the positive trend observed in Figures 6 and 7 for the number of Ghanaian-Foreign IJV projects, local employment creation and construction sector jobs suggest consistent exposure of local parties to foreign technology and related knowledge. Real technological advancement, however, is yet to be realized as the prevailing situation depicts. Typically, foreign parties reportedly subscribe to non-voluntary IJVs as a means to penetrate new or promising markets as part of strategic business moves (cf. Ofori, 2000; Osabutey & Debrah, 2012). The burgeoning construction market in Ghana is reason for many foreign firms to seek participation. Local firms on the other hand see this as an opportunity to increase their competitiveness by forming IJVs with foreign parties for short- or medium-term gains (see: Obeng-Odoom, 2015). It follows therefore, that local-foreign involvement in IJVs may not necessarily be in the interest of T&K transfers for tangible technological advancement in the construction sector. After over a decade of having an oil and gas sector, IMANI (2018) reports that there is no local firm in Ghana with the capacity to execute projects (and deliver products) to support upstream oil and gas operations. This is in spite of the LI 2204 which is meant to help develop local capacity in the

sector through prescribed obligations for foreign involvement with locals in IJV formation.

Similar to the number of local employment created through FDI in general, the number of construction sector jobs created for Ghanaians has seen steady increment from 2007 to 2018 (see Figure 6). From the positive it is evident that over the years, more Ghanaians have been exposed to some levels of foreign T&K by means of association on construction sector FDI projects through IJVs (cf. Tang & Gyasi, 2012; Boakye-Gyasi & Li, 2015). Notwithstanding the preceding, capabilities to use and improve on foreign technologies are lacking locally (Osabutey et al., 2014). It is observed that even when local parties are employed in IJVs with foreign parties, they are more often than not recruited to fill low-ranking positions where they have little to no involvement in key decisions regarding new technology and their use on projects (cf. Ofori, 2000, 2007). Local actors are likely to be directed to use components of a technology without necessarily having an understanding of how it could be localised and exploited in the future. Consequently, when foreign parties depart after completing an FDI project aimed to transfer T&K, there are machines or tools left behind, and local workers who know the 'how', but lack the required knowledge to adapt or modify them for future use. This phenomenon has also been reported in Iran and Egypt (cf. Saad et al., 2002), and is evidenced in the post-project situation of the Saglemi Housing Project, where components of the foreign technology used are present in Ghana, but evidence of adequate local training to use the technology remains questionable (Oti-Sarpong, 2019). The preceding might perpetuate in Ghana if the Government continues to rely heavily on FDI records to infer T&K transfer and technological advancement in the Ghanaian construction sector from project to project.

CONCLUDING REMARKS

The paper analysed FDI trends and argued how that has not necessarily translated into technological advancement in Ghana. To this end the paper highlights the shortcomings in reliance on FDI inflows to infer T&K transfer and consequently technological advancement in the construction sector. By examining fifty-two quarterly FDI reports spanning thirteen years the paper highlights how, regardless of increasing FDI into developing countries on the continent, a strategic sector like construction still falls behind in the use of technology.

The insights from Ghana's sector holds implications for that of of other developing countries. The nature of the sector requires a different means of evaluation for T&K transfer under FDI arrangements. Evaluating T&K transfer on construction FDI projects will be inadequate if limited to figures generated from local employment

created and hours of training conducted. It is important for further steps to be taken in developing tailored project requirements to ensure that specific technology and knowledge are adequately transferred to the local parties. Additionally, limiting the evaluation to the duration of the project is inadequate. Post-project evaluations are therefore critical to find out if the local parties are able to employ the acquired T&K on future projects. Here, there is an implication for governments to consider formulating strategic policies that will ensure that there is consistency in the provision of relevant jobs for the local firms who have been exposed to some foreign T&K in the past whilst engaged on FDI-driven construction projects.

The findings hold significance in two ways. First, it provides an exemplary understanding of how consistent FDI inflows do not necessarily contribute to technological advancement of construction firms in recipient countries. Second, the insights serve as a foundation for future empirical studies to provide more detailed insights to explicate the questions the findings herein beget about the state of local construction firms in terms of technological advancement amidst favourable FDI trends. Third, the findings bring forward the importance of disaggregating the concept of technology into different dimensions to help the formulation of detailed policies and strategies accordingly. There needs to be a much more comprehensive framework that is able to assess over time the transfer of technology to local actors. In this regard, a longitudinal qualitative examination of construction firms who have partnered with foreign parties on IJV FDI projects is a useful future research direction. Such corroboration through other empirical studies would prove useful in further clarifying how FDI projects and policies could be restructured to help achieve desired impacts on the technological advancement of construction sectors in Africa at large.

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